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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/233,377	Applicant(s) SANDHU ET AL.	
	Examiner Thanhha Pham	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/19/02* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24,45 and 52-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24, 45 and 52-70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 20.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 2/19/02 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 59-70 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 59,

Line 4, "stress inducing atoms" should be changed to "compressive stress inducing atoms" to be consistent with claimed term being used in claim 59 line 5-6 and specification page 10 lines 22-24 and page 11 lines 1-7.

With respect to claim 62,

Lines 8-10, "after forming the refractory metal silicide comprising the first crystalline phase, annealing the refractory metal silicide comprising the first crystalline phase to convert the first crystalline phase to a second crystalline phase" renders the

claim indefinite. It is not clear that the refractory metal silicide comprising the first crystalline phase would include the stress inducing atoms comprising Ge therein and/or the compressive stress inducing material layer thereover or not, when being annealing to convert the first crystalline phase to the second crystalline phase.

With respect to claim 63,

It is not clear that "a silicon containing substrate" on line 5-6 is the same as "the substrate" on line 4 or not.

With respect to claim 66,

Lines 4-5, it is not clear how "stress inducing material" is disposed operationally coupled to the refractory metal silicide.

Lines 7-9, "after forming the refractory metal silicide comprising a first crystalline phase, annealing the refractory metal silicide comprising the first crystalline phase to convert the first crystalline phase to a second crystalline phase" renders the claim indefinite. It is not clear that the refractory metal silicide comprising the first crystalline phase, when being annealing to convert the first crystalline phase to the second crystalline phase, would include the stress inducing atoms therein and/or the compressive stress inducing material (as cited on lines 4-6).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in-
(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 24, 52-54, 59-66, 68-70 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Apte et al [US 5,593,924].

Apte et al, figs 1-6 and col 1-4, discloses the claimed method of forming a refractory metal silicide layer comprising steps of:

forming a titanium metal layer (20, fig. 2) over a silicon containing substrate (10);

providing first compressive stress inducing atoms Ge into the titanium metal layer (col. 2 lines 66-67 and col. 3 lines 1-5 & 52-56);

first annealing the titanium metal layer containing the compressive stress inducing atoms Ge to form a titanium silicide layer (32, C49, fig. 3) substantially comprising a first crystalline phase after providing the first compressive stress inducing atoms Ge;

providing second compressive stress inducing atoms Ge into the titanium silicide layer comprising the first crystalline phase (col. 3 lines 49-56);

forming a compressive stress inducing material layer (36, silicon nitride, fig. 5, col 3 lines 57-67) over the titanium silicide layer comprising the first crystalline phase; and

second annealing the titanium silicide layer comprising the first crystalline phase and having the compressive stress inducing atoms Ge therein and the compressive stress inducing material layer thereover under conditions effective to transform the titanium silicide layer to a denser layer substantially comprising a second crystalline phase (C54, col. 4 lines 4-29).

With respect to claim 64, the titanium silicide layer comprising the first crystalline phase C49 would have a first temperature coefficient of expansion wherein the compressive stress inducing material comprising silicon nitride having a second temperature coefficient of expansion that is less than the first temperature coefficient of expansion.

The claiming of a new use, new function or unknown property which is inherently present in prior art does not necessarily make the claim patentable. See In re Best, 562 F 2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977).

4. Claims 24 and 52 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cabral et al [US 5,828,131].

Cabral et al, fig 1-16 col 1-12, discloses the claimed method of forming a refractory metal silicide comprising steps:

forming a titanium metal layer over a silicon containing substrate and providing compressive stress inducing atoms being larger than silicon atoms (e.g. refractory metal W in Ti-alloy, col 11 lines 48-52 and col 10 lines 15-18);

after the providing, first annealing the titanium metal layer containing the compressive stress inducing atoms to form a titanium silicide layer substantially of a first crystalline phase (C49);

second annealing the titanium silicide layer of the first crystalline phase under condtions effective to transform said titanium silide layer to a more dense layer substantially of a second crystalline phase (C59).

[see col 11 lines 48-67 and col 12 lines 1-49 for details]

5. Claims 45, 55, and 57-58 are rejected under 35 U.S.C. 102(a) as being anticipated by Kawamura et al [JP 8139056].

Kawamura et al teaches the claimed method of forming a refractory metal silicide comprising steps:

providing a compressive stress inducing material (9, fig. 5B) over a first side of a substrate (1);

forming a refractory metal silicide (6,7, Titanium silicide C49, fig. 5B) over the compressive stress inducing material (9), the metal silicide comprising a first crystalline phase (C49);

after forming the refractory metal silicide, annealing the refractory metal silicide comprising the first crystalline phase to form a refractory metal silicide of a second crystal phase (6,7, titanium silicide C54, fig. 5C).

6. Claims 45 and 55-58 are rejected under 35 U.S.C. 102(a) as being anticipated by Kawamura et al [JP 8139056].

Kawamura et al teaches the claimed method of forming a refractory metal silicide comprising steps:

providing a compressive stress inducing material (11, silicon oxide, fig. 2A) over a first side of a substrate (1);

forming a refractory metal silicide (6,7, Titanium silicide C49, fig 2B) over the compressive stress inducing material (11), the metal silicide comprising a first crystalline phase (C49);

after forming the refractory metal silicide, annealing the refractory metal silicide comprising the first crystalline phase to form a refractory metal silicide of a second crystal phase (6,7, titanium silicide C54, fig 2C).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 45, 55-57 and 67, as being best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Apte et al [US 5,593,924] in view of Kawamura et al [JP 8139056].

Apte et al, figs 1-6 and col 1-4, discloses a method of forming a refractory metal silicide layer comprising steps of:

forming a titanium silicide layer (32, C49, fig 3) over a first side of a substrate (10), the titanium silicide layer comprising a first crystalline phase;

disposing introducing stress inducing atoms Ge into the titanium silicide layer (col. 3 lines 49-56); and

annealing the refractory metal silicide comprising the first crystalline phase including the introducing stress inducing atoms Ge to convert the first crystalline phase (C49) econd crystalline phase (C54).

Apte et al does not teach disposing stress inducing material layer on a second side of the substrate wherein the second side is opposed the side of the substrate and the titanium silicide layer is over the stress inducing material layer.

However, Kawamura et al teaches disposing stress inducing material layer on the second side of the substrate wherein the second side is opposed the side of the substrate and the titanium silicide layer is over the stress inducing material layer to provide a stress to the titanium silicide layer of the first crystalline phase (C49). By doing so, the phase transformation of the titanium silicide layer from the first crystalline phase (C49) to the second crystalline phase (C54) is promoted in subsequent step of annealing.

Therefore, it would have been obvious for those skilled in the art to combine the teaching of Kawamura et al to dispose the stress inducing material layer on the second side of the substrate wherein the second side is opposed to the first side of the

substrate and the titanium silicide layer is over the stress inducing material layer to perform a better process of forming the titanium silicide layer with the second crystalline phase C54 as reasons give above.

Response to Arguments

9. Applicant's arguments filed 2/19/02 have been fully considered but they are not persuasive.

- Contradict to Applicants' argument on pages 11-16, claims 45 and 55-58 are anticipated by Kawamura et al [JP 8139056].

  In contrast to Applicants 's argument, Kawamura et al teaches layer (11, silicon oxide, embodiment of figure 2B) as the compressive stress inducing material layer over the first side of the substrate and the titanium silicide layer (6,7, fig 2B) is formed over the compressive stress inducing material layer. Kawamura et al, text paragraph [0044]-[0045], teaches that, by forming the silicon oxide layer (11, fig 2B) and removing the silicon oxide layer (fig 2C) after thermal processing step of a first time, the warp of the substrate is reconstructed therefore a compressive stress is added to the titanium silicide layer (6,7) comprising the first crystalline phase C49. Clearly, the silicon oxide (11, fig 2B) functions as a compressive stress inducing material to the titanium silicide layer even though the silicon oxide is removed to provide a compressive stress to the titanium silicide layer comprising the first crystalline phase C49. The silicon oxide layer (11, fig 2B) of Kawamura et al is the compressive stress inducing material layer as being claimed since Applicants do not

claim that the titanium silicide layer comprising the first crystalline phase is annealed to form the titanium silicide layer of a second crystalline phase wherein the compressive stress inducing material layer is still on the first side of the substrate during said step of annealing. Regarding to Applicants' argument that Kawamura et al fails to teach forming a compressive stress inducing material layer over a first side of a substrate and forming a refractory metal silicide over the compressive stress inducing material layer, fig 2B of Kawamura et al shows the compressive stress inducing material layer (11) is over the first side of the substrate (1) and the titanium silicide layer (6,7, first crystalline phase C49) is over the compressive stress inducing material layer (11) – As in claim 45, "forming a refractory metal silicide over the compressive stress inducing material layer" does not mean that the refractory metal silicide must be on the same side (the first side) of the substrate.

In contrast to Applicants 's argument, Kawamura et al teaches layer (9, embodiment of figure 5B-5C) as the compressive stress inducing material layer over the first side of the substrate and the titanium silicide layer (6,7, fig 5B) is formed over the compressive stress inducing material layer. Kawamura et al, text paragraph [0062]-[0064] and fig 5C, teaches that the layer (9) is the compressive stress inducing material layer. Figure 5B of Kawamura et al shows the compressive stress inducing material layer (9) is formed over the first side of the substrate and the titanium silicide layer (6,7) comprising the first crystalline phase is formed over the compressive stress inducing material layer -- As in claim 45, "forming a refractory metal silicide over the compressive stress inducing material layer" does

not mean that the refractory metal silicide must be on the same side (the first side) of the substrate.

- Contradict to Applicants' argument on page 17, claims 24 and 52 are anticipated by Cabral et al [US 5,828,131].

The same as Applicants' invention, Cabral et al uses the refractory metal atoms (e.g. W in the Ti-alloy) which is larger than silicon atoms to lower the phase transformation temperature of the titanium silicide from C49-C54. Although Cabral et al does not name the refractory metal atoms (e.g. W in the Ti-alloy) as the compressive stress inducing atoms in the titanium layer, based on the function and characteristics of the W atoms in the Ti-alloy layer the same as Applicants' invention, the refractory metal atoms (e.g. W in the Ti-alloy) of Cabral et al are the compressive stress inducing atoms in the titanium layer of Applicants' invention. Moreover, claiming of a new use, new function or unknown property which is inherently present in prior art does not necessarily make the claim patentable. See In re Best, 562 F 2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (703) 308-6172. The examiner can normally be reached on Monday-Thursday 8:00 AM - 7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaudhuri Olik can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-3432 for regular communications and (703) 308-7725 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Thanhha Pham
May 5, 2002

Tuan H. Nguyen
Primary Examiner